

ITMD 445 SYLLABUS**ITMD 445 Web Real-Time Communications**

Hours: 3 credit hours / 45 contact hours

Instructor: Karl Stolley

Textbook, title, author, and year:

- a. *Programming WebRTC: Build Real-Time Streaming Applications for the Web*. Stolley, K., 2022.

Specific course information:

- a. Catalog description: This course covers the WebRTC specification's set of protocols, architectures, and APIs designed to enable browser-to-browser real-time communication of voice, video, and data. Students will learn to apply basic technologies including WebSockets, HTTP, HTML5, Web Sockets, NAT, STUN, TURN, and ICE to ensure two-way real-time communication. Students will use JavaScript and development environments to create basic data and media applications based on WebRTC technologies and will analyze the impact of their applications on the performance and behavior of the networks that carry them.
- b. **Prerequisites:** ITMD 441.

Specific goals for the course**a. Course Outcomes:**

Students completing this course will learn to:

- Describe the architecture and function of WebRTC's APIs in the browser
- Reference the contents of the WebRTC specification
- Build forward- and backward-compatible streaming applications in WebRTC according to the perfect-negotiation pattern
- Analyze complex computing problems and apply principles of computing and other relevant disciplines to identify solutions
- Participate in the creation, execution, and ongoing revision of an effective project plan
- Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements
- Communicate effectively in a variety of professional contexts
- Function effectively as a member or leader of a team engaged in advanced web development
- Identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems
- Apply security principles and practices to maintain operations in the presence of risks and threats

c. Course student outcomes:

At the conclusion of this course, successful students will be able to:

- Command the suite of technologies and APIs that comprise WebRTC in the browser
- Leverage a signaling server and the perfect-negotiation pattern to connect modern browsers over WebRTC
- Explore automated testing to ensure code quality on WebRTC applications
- Deploy WebRTC applications in production, including configuring a private STUN/TURN server

- Problem-solve and create innovative answers to provide technology solutions for the problems of business, industry, government, non-profit organizations, and individuals.
- Perform requirements analyses, design, and administration of computer and network-based systems conforming to policy and best practices, and monitor and support continuing development of relevant policy and best practices as appropriate.
- Apply current technical and mathematical concepts and practices in the core information technologies and recognize the need to engage in continuing professional development.

Topics to be covered:

- a. WebRTC as a Web Standard
- b. Non-blocking Real-Time Foundations
- c. WebRTC Foundations I: HTTPS, Media Permissions
- d. WebRTC Foundations II: Signaling, Connection, Perfect Negotiation
- e. Alternative Signaling Servers
- f. WebRTC Data Channels
- g. Browser Compatibility and "Perfected" Negotiation
- h. Cross-Browser Feature Detection
- i. Binary Data
- j. Multipeer Connections and Mesh-Network Topography
- k. Multipeer Calls and Scale
- l. STUN/TURN Servers
- m. Testing WebRTC
- n. WebRTC in Production
- o. Monitoring with RTCStats